EPA420-S-01-001
September 2001

Light-Duty Automotive Technology and Fuel Economy Trends

1975 Through 2001

Executive Summary

Advanced Technology Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

Introduction

This report summarizes key fuel economy and technology usage trends related to model year 1975 through 2001 light vehicles sold in the United States. Light vehicles are those vehicles that EPA and the U.S. Department of Transportation (DOT) classify as cars or light-duty trucks (sport utility vehicles, vans, and pickup trucks with less than 8,500 pounds gross vehicle weight ratings).

Average new light vehicle fuel economy continues to decline. Since peaking at 22.1 mpg in 1987 and 1988, average light vehicle fuel economy has declined nearly eight percent to 20.4 mpg, and for 2001 is lower than it has been at any time since 1980. The primary reasons for this decline are the increasing market share of less efficient light trucks, increased vehicle weight and increased vehicle performance.

The fuel economy values in this report are based on laboratory data, but for most tables and analyses in the report have been adjusted downward, by about 15 percent, so that this data is equivalent to the real world estimates used on new vehicle labels, in the EPA/DOE *Fuel Economy Guide* and in EPA's *Green Vehicle Guide*. These adjusted fuel economy values, therefore, are significantly lower than those used by the DOT for compliance with fuel economy standards. In addition, the values in this report exclude Corporate Average Fuel Economy (CAFE) credits for alternative fuel capability and corrections for test procedure adjustments, that are included in the fuel economy data reported by DOT.

Importance of Fuel Economy

Fuel economy continues to be a major area of public and policy interest for several reasons, including:

(1) Light vehicles account for approximately 40 percent of all U.S. oil consumption. Crude oil, from which nearly all light vehicle fuels are made, is considered to be a finite natural resource.

(2) Fuel economy is directly related to the cost of fueling a vehicle and is of greater interest when oil and gasoline prices rise, as has been the case in 2000 and 2001.

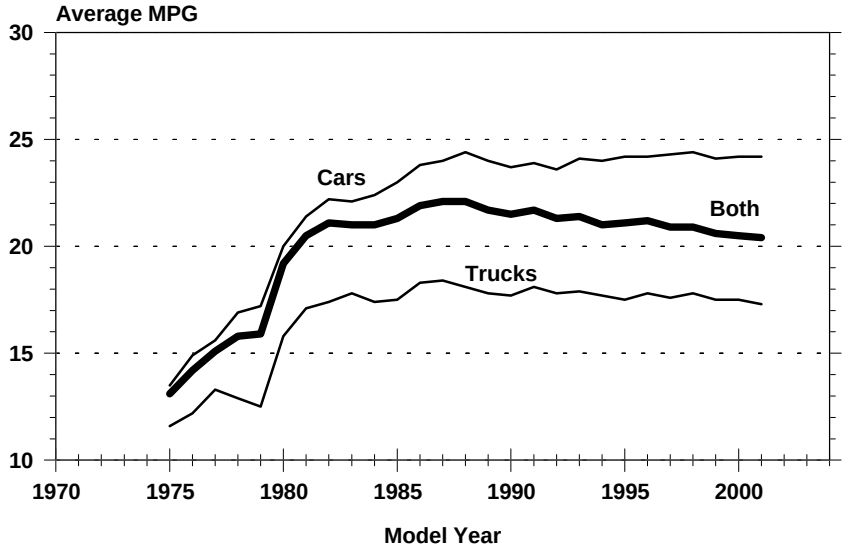
(3) Fuel economy is directly related to carbon dioxide emissions from light vehicles which contribute about 20 percent of all U.S. carbon dioxide emissions. Carbon dioxide is the most prevalent emission that many scientists associate with global warming.

Highlight #1: Fuel Economy Is at a 21 Year Low

There has been an overall declining trend in new light vehicle fuel economy since 1988. The average fuel economy for all model year 2001 light vehicles is 20.4 mpg and is lower than it has been at any time since 1980. This value is 1.7 mpg (almost eight percent) lower than the peak value of 22.1 mpg achieved in 1987 and 1988. Within the light vehicle category for model year 2001, average fuel economy is 24.2 mpg for cars and 17.3 mpg for light trucks.

New light vehicle fuel economy improved fleet-wide from the middle 1970s through the late 1980s, but it has been consistently falling since then. Viewed separately, the average fuel economy for new cars has been essentially flat over the last 16 years, varying only from 23.6 mpg to 24.4 mpg. Similarly, the average fuel economy for new light trucks has been largely unchanged for the past 20 years, ranging from 17.3 mpg to 18.4 mpg. The increasing market share of light trucks, which have lower average fuel economy than cars, accounts for much of the decline in fuel economy of the overall new light vehicle fleet.

Fuel Economy by Model Year



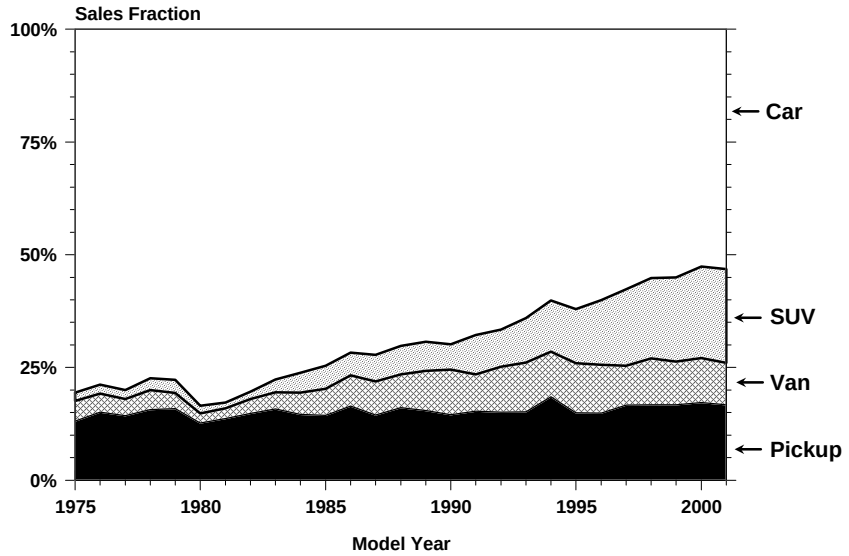
* Note the fuel economy data in this report have been revised since the previous paper in this series was issued and adjusted downward by about 15 percent to be equivalent to the real world estimates used on new vehicle labels, in the *Fuel Economy Guide* and the *Green Vehicle Guide*.

Highlight #2: Trucks Represent Nearly Half of New Vehicle Sales

Sales of light trucks, which include sport utility vehicles (SUVs), vans, and pickup trucks, have risen steadily for over 20 years and now make up nearly 47 percent of the U.S. light vehicle market–-more than twice their market share in 1983.

Growth in the light truck market has been led recently by the explosive popularity of SUVs. The SUV market share increased by more than a factor of ten, from less than 2 percent of the overall new light vehicle market in 1975 to nearly 22 percent of the market in 2001. Over the same period, the market share for vans more than doubled from 4.5 to 9.3 percent, and for pickup trucks, grew from 13 to about 17 percent. Between 1975 and 2001, market share for new passenger cars and station wagons decreased from 81 to 53 percent. For model year 2001, cars average 24.2 mpg, vans 19.3 mpg, SUVs 17.2 mpg and pickups 16.5 mpg.

Sales Fraction by Vehicle Type

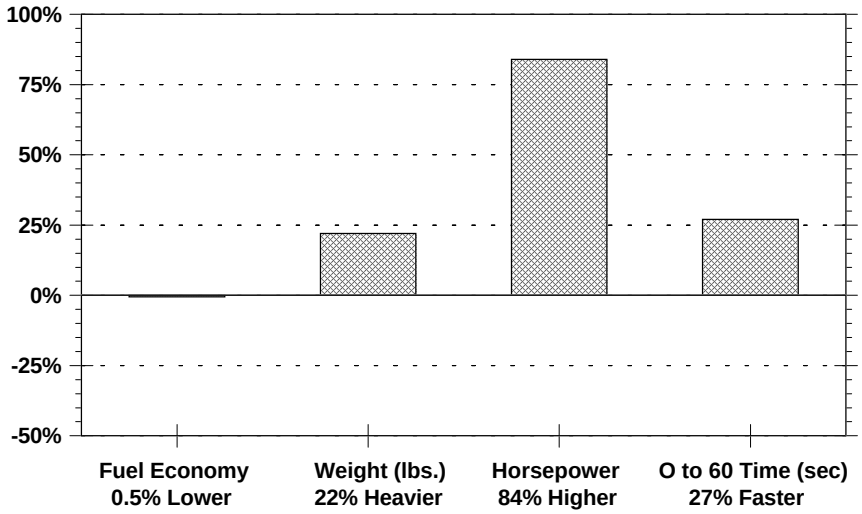


Highlight #3: Over the Past 20 Years, Fuel Economy is Relatively Constant, While Vehicle Weight and Power are Increasing

More efficient technologies continue to enter the new light vehicle fleet and are being used to increase light vehicle weight and acceleration while fuel economy is not being increased. Model year 2001 light vehicles will have about the same average fuel economy as those built twenty years ago in model year 1981. Based on accepted engineering relationships, however, had the new 2001 light vehicle fleet had the same average weight and performance as in 1981, it could have achieved more than 25 percent higher fuel economy.

More efficient technologies -- such as engines with more valves and more sophisticated fuel injection systems, and transmissions with lockup torque convertors and extra gears -- continue to penetrate the new light vehicle fleet. The trend has clearly been to apply these new technologies to accommodate increases in average new vehicle weight, power, and performance while maintaining a constant level of fuel economy. This is reflected by heavier average vehicle weight (up 22 percent since 1981), rising average horsepower (up 84 percent since 1981), and lower 0 to 60 mile-per-hour acceleration time (27 percent faster since 1981).

Percent Change from 1981 to 2001
in Average Vehicle Characteristics

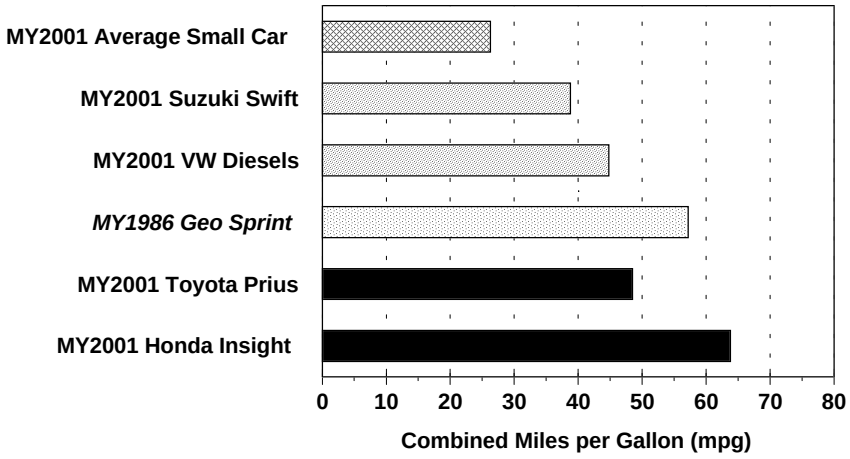


Highlight #4: Vehicles with Highly Fuel Efficient Hybrid Propulsion Systems are Beginning to Penetrate the Automotive Fleet

During the past 25 years, the most significant change to light vehicle fuel economy technologies may be the introduction of vehicles with hybrid propulsion systems.

The model year 2001 light vehicle fleet includes two hybrid vehicles: the Honda Insight, which was introduced in 2000, and the Toyota Prius, which was introduced in the U.S. market in 2001. Both of these hybrid vehicles are equipped with propulsion systems that include as key components gasoline engines, motor/generators and batteries. The manual transmission equipped, two-seater Insight has *Fuel Economy Guide/*label ratings of 61 mpg city and 68 mpg highway. The Prius, a compact car with *Fuel Economy Guide*/label ratings of 52 mpg city and 45 mpg highway, is the second highest fuel economy vehicle on the market in 2001. The Insight's combined fuel economy value is about 12 percent higher than the most fuel efficient conventionally powered vehicle sold in the United States since 1975, a model year 1986 Geo Sprint mini-compact. The Insight's fuel economy is also more than 40 percent higher than that for the model year 2001 Volkswagen Beetle/Golf/Jetta diesels and a gasoline-powered Suzuki Swift. All of these conventionally powered vehicles are equipped with manual transmissions.

Comparison of the Hybrid Vehicles with Other High Fuel Economy Vehicles



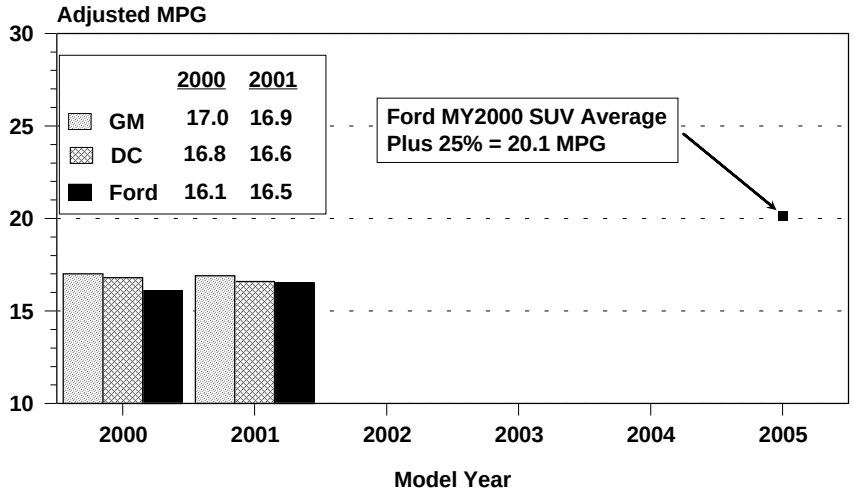
Highlight #5: Recent Pledges to Voluntarily Increase Fuel Economy

On July 27, 2000, Jacques Nasser, Ford Motor Company's chief executive, pledged to increase the fuel economy of its entire line of sport utility vehicles by 25 percent by the 2005 calendar year. A few days later, on August 2, 2000, Harry Pearce, General Motors vice chairman, pledged GM would remain the light truck fuel economy leader. On April 7, 2001, Jürgen Schrempp chairman of DaimlerChrysler, stated that the fuel economy of their "fleet will match or exceed those of other full-line manufacturers."

If all manufacturers were to voluntarily increase the average fuel economy of their entire light vehicle fleets by 25 percent by 2005, average new light vehicle fuel economy would increase by five miles per gallon.

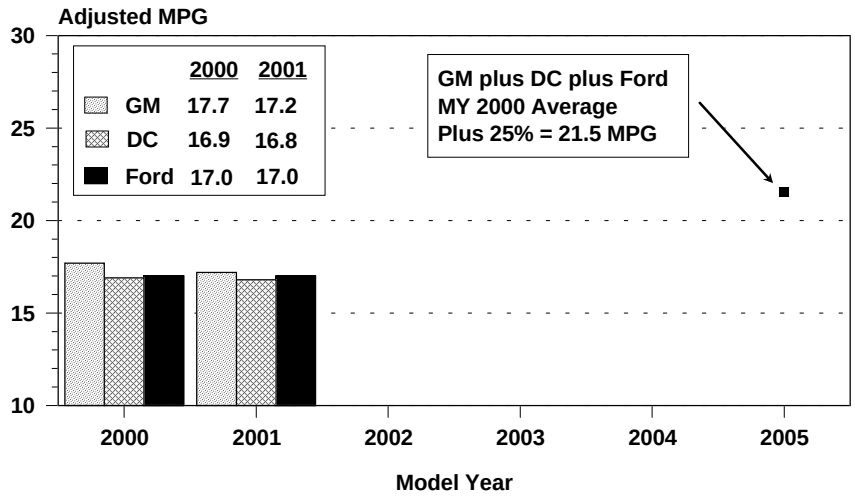
Based on the data available to date, with model year 2000 as the base line the following graphs show the initial progress the Ford (defined as Ford, Jaguar, Volvo, Land Rover and Mazda), General Motors (i.e., GM, Suzuki, Saab, Isuzu and Subaru) and Daimler Chrysler (i.e., Chrysler, Mercedes, and Mitsubishi) marketing groups have made toward meeting their fuel economy improvement pledges.

SUV Fuel Economy by Marketing Group

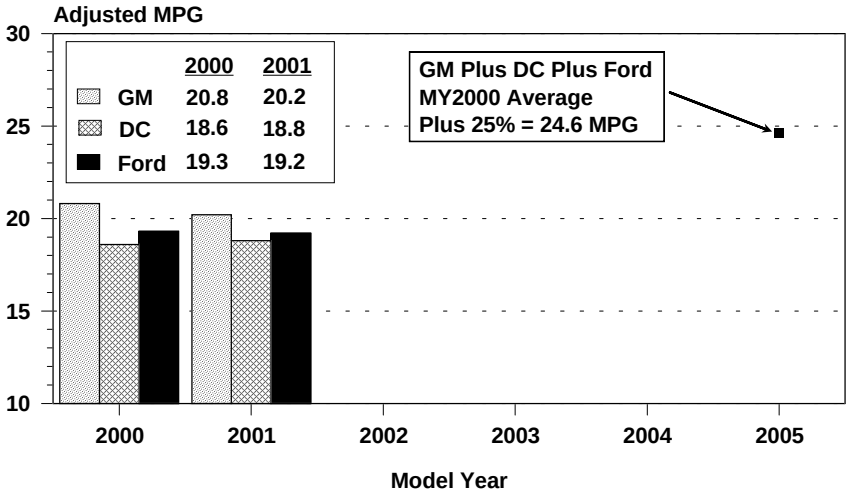


The figures below show the fuel economy (mpg) performance by marketing group for light trucks (i.e., vans, SUVs and pickups) and personal use (car and light truck) fleets for model years 2000 and 2001 and a projection for model year 2005 that represents a 25% increase from the model year 2000 fuel economy average.

Light Truck Fuel Economy by Marketing Group



Personal Use Vehicle Fuel Economy by Marketing Group



For More Information

Light-Duty Automotive Technology and Fuel Economy Trends 1975 through 2001 (EPA420-x-x-xxx) is available electronically on the Office of Transportation and Air Quality's (OTAQ) Web site at:

http://www.epa.gov/otaq/fetrends.htm

Printed copies are available from:

U.S. Environmental Protection Agency
National Service Center for Environmental Publications
P.O. Box 42419
Cincinnati, OH 45242-2419
(800) 490-9198

You can also contact the OTAQ library for document information at:

U.S. Environmental Protection Agency
Office of Transportation and Air Quality Library
2000 Traverwood Drive
Ann Arbor, MI 48105
(734) 214-4311

A copy of the *Fuel Economy Guide* giving city and highway fuel economy data for individual models is available at http://www.fueleconomy.gov or by calling the U.S. Department of Energy's National Alternative Fuels Hotline at (800) 423-1363.

EPA's *Green Vehicle Guide* provides information about the air pollution emissions and fuel economy performance of vehicles; it is available on EPA's web site at http://www.epa.gov/greenvehicles/